NOTES AND COMMENTS.

CAN WE DO AWAY WITH FOG?

"NEW YORK, November 7.—For forty consecutive hours the fog has had uninterrupted and impenetrable reign over the city, bays and rivers for fifty miles around. Navigation is fraught with great danger, and travel by rail is delayed one-half to two hours. Transatlantic steamers are greatly delayed, and no European mail has been delivered in the city since Monday. The Fall River line steamer "Priscilla," which left Newport last night, had not reached her pier up to 10 o'clock this morning. Several hundred passengers are on board. Several collisions occurred in the rivers and harbors, but none serious in results."

"Forty-eight hours later, one of the largest Sound steamers went ashore in the fog, on the north side of Great Gull Island."

Items like the above probably pass from the mind of the average reader a few minutes after the time of reading. The traveller, however, who has hung 'twixt sea and land, knowing himself to be almost within touching distance of the latter, has a livelier memory of the fog and the danger in which he was placed. Within a pier's length of their dock, when a dense fog prevails, our ferry-boats and river steamers bump about and feel their way inch by inch, to the imminent peril of the passengers.

Fog in its right setting—the upper air—fog is both pleasing and significant; but resting close to earth, it is "an unmitigated nuisance." It was so characterized by the English university professor, to whose work reference is made below; and with neither hesitation nor reservation will most travellers join in the frank and forcible declaration. Granted, then, that a cloud out of place, in other words a fog, is both a nuisance and a menace, are there any ways or means by which the undesired condition can be modified?

Three years ago the attention of the community was directed to the question of the artificial production of rain. The principle upon which rain was to be made, as it was commonly stated, viz., concussion of the air, was neither countenanced nor accepted by meteorologists. The results of the experiments were exactly such as were forecasted by men who knew the worthlessness of the claims then made, and yet fully realized that rain-making was nevertheless a scientific possibility. The rain engineer will some day be enrolled among the professional occupations. He will be one who has closely followed and clearly comprehends the physical processes of cloudy condensation. He must be something of the physicist, chemist and meteorologist combined. Problems such as Hertz solved in his graphic methods of following adiabatic changes in moist air, or von Helmholtz discussed in his papers on "billow" cloud formation will be appropriate work for him. The changes which a cubic foot of air charged with a given amount of vapor goes through as it moves from place to place in the atmosphere he will understand and control. Air at sea level at a temperature of eighty degrees Fahrenheit, half-filled with moisture, has eleven grams of water vapor in

each kilogram of air. If the pressure is suddenly changed from 750 millimetres to 687 millimetres, the temperature lowered about fifteen degrees, certain conditions result. The air is in the condition of a soaked sponge, and has all the water vapor it can hold. If the mixed air and vapor can be lifted about four thousand feet the rain engineer can ordinarily form a cloud or fog. Conversely if he can increase the pressure and supply the requisite amount of heat he can alter conditions so that no fog forms or if it has formed, cause it to disappear. Provided we can control the thermodynamic conditions we can condense the invisible vapor of the air into visible cloud and, on the other hand, change the visible fog into invisible vapor.

Fog formation suggests fog dissipation; and the questions which we propose to discuss in this paper are, therefore, first: What fog is, how it is formed, and how we can do away with it.

Fog may form in at least three different ways; first, where the air is cooled by rapid radiation; second, where the cooling results from a mixture of different air currents, and third, where the cooling has been caused by an upward motion of the air. The first is the most common cause of fog formation, especially the so-called ground fogs. Radiation fog is formed most generally over surfaces nearly level when warm air comes in contact with the cold ground. Sea fogs occur when there is a marked difference between the temperature of the water and the air or when two currents of water of different temperatures are contiguous. Coast fogs and these are the most annoying and dangerous, are formed when inflowing moist air from the sea passes over a chilled land. In some localities, *e. g.* San Francisco, it happens that a mass of air warmed over the land is pushed seaward, absorbing a large amount of moisture. When a sea-breeze in turn pushes the air toward the coast the air is chilled from the rear, fog forms over the water and is carried landward.

Clear and quiet weather is favorable to the formation of fog; and the growth is generally from the ground upward. There are also differences in the constitution of fogs. Clement Ley, perhaps the keenest cloud observer that we have, divides fog generally into wet fog and dust fog. Of the former he says: "When the particles are large enough to be precipitated rather rapidly to the earth and yet not large enough to be called rain, we have '*nebula stillans*' or wet fog. On the other hand, a town fog is more apt to be a dust fog . . . the great cause of the persistence and opacity of town fog is the presence of carbon, which determines the conversion of vapor into fog particles . . . the name '*nebula pulverea*' is given to this class of fog." John Aitken has shown us within the past five years by means of a very sensitive dust counter, just how many dust particles there are in a cubic centimeter of air in different localities and in the same locality at different times. At Cannes, for example, he found 1,550 dust particles per cubic centimetre when the wind was from the mountains, and 150,000 when the wind was from the town. He has also shown us how close is the relationship between fog, cloud, haze, and the *number* of dust particles. If there are few dust particles there are few nuclei for condensation.

Without stopping longer on these questions, we pass to the work of Dr. Oliver Lodge, Professor of Physics at University College, Liverpool, to whom we made reference above. In a lecture before the British Association at the Montreal Meeting, in summing up the various ways of removing dust from air, Lodge mentions the following:

1. Filtration through cotton wool and glycerine.
2. Allowing the air to settle.
3. Condensing the vapor in the air several times.
4. By keeping a hot body in the air for some time. This is what Tyndall calls "calcining" the air.
5. Discharging electricity into the air from a point.

The last named process is the one most effective and in our judgment one containing great possibilities when applied to fog dissipation. If we discharge electricity into dusty air we can remove the dust from the air, and removing the dust means control of fog. The writer has shown in public how wonderfully rapid and effective electrical discharges of very high potential are in scattering smoke and clarifying dust-laden atmospheres. Much might be said of certain experiments but for the present we will use Lodge's words to describe some of the curious effects of a brush discharge in dusty air, inasmuch as the experiments were original with him.

"A bell-jar of illuminated magnesium smoke was connected with one pole of a Vose machine. A potential able to give quarter-inch or even tenth-inch spark is ample and better than a higher one. The smoke particles very quickly aggregate into long filaments, which point along the lines of force, and which drop by their own weight when the electrification is removed. A higher potential tears them asunder and drives them against the sides of the jar. A knob polarizes the particles as well as a point, but does not clear the air of them so soon. If the bell-jar be filled with steam, electrification rapidly aggregates the particles or globules into Scotch mist and fine rain."

Dr. Lodge goes on to show how a small cellar may be cleared of thick turpentine smoke by a point discharge. There can be no doubt that air is speedily cleansed of its solid particles by a continued electrical discharge. Many practical applications of the principle suggest themselves, such as purifying the air of smoking-rooms, theatre galleries, and disinfecting the air of hospital wards. In fog dissipation the problem is simply an increase in the size of the dust nuclei of condensation, under gentle electrification until these settle, or, under powerful electrification, to cause a rapid scattering and deposition of the electrified drops.

Lodge wrote in 1887, "coming to this country, we lay for some hours outside the Straits of Belle Isle in the midst of icebergs and fog. Icebergs alone are not dangerous but beautiful. Fog is an unmitigated nuisance. Electric light is powerless to penetrate it, and as we lay there idle, it was impossible not to be struck with the advisability of dissapating it. It is rash to predict what can be done. It is still rasher to predict what cannot be done. I would merely point out that on board a steamer are donkey engines, and that these can drive a very powerful Holtz or Wimshurst machine, one pole of which may be led to points on the masts. When electricity is discharged into fog on a small scale, the fog coagulates into globules and falls as rain. Perhaps it will on a large scale too."

Less than ten years have passed since the suggestion was thus casually made of the possibility of fog dissipation, and in that time great changes have been made in electrical apparatus. All ships and steamboats of any size are now provided with dynamos, and the generation of a high potential current is a very easy matter. The insulation properties of various materials, such as mica and quartz, which were not in use ten years ago, make them available for use with high potentials. It is a comparatively easy and inexpensive matter by means of proper transformers in series to run up to a potential of forty or fifty thousand volts. Then with a suitable arrangement of terminals a network of fiery discharges might be made to stream out into the fog either from the mastheads or from suitable poles, and the electrification of the air be thus widely effected. Within a reasonable distance such discharges would certainly dissipate the fog and clarify the air.

Of course, the supply of fog may be such that there would be no apparent diminution. But such cases are probably exceptional. It is to be remembered that, as a rule, strong winds do not prevail during fog, and that in most places the fog has well-marked limits and is localized. The task of dissipating the fog of a channel like that between the Hudson and East rivers at the Battery is not more formidable, provided every vessel passing kept its fog dispellers at work, than the removal of the snowfall of a single storm from Broadway by means of numberless carts and horses. We are at great expense and trouble to remove the snow or solid vapor of the air: surely we will not grudge effort nor count expense to do away with fog. Upon warships, ferry-boats, and at all terminal points and crowded localities, fog dissipators would save life and property. Perhaps the following scrap of history of our own metropolis, and not London, will give point to what has been said above:

"November 19.—A dense fog settled over the city and vicinity at daylight this morning, greatly delaying traffic. A serious accident occurred on Brooklyn bridge shortly before eight o'clock, directly due to the fog. While on the way to Brooklyn station the train was forced to stop about 200 yards from the station. The train behind came along at a rapid rate and a serious collision resulted. A brakeman had both legs cut off and cannot recover. The accident caused an immediate stoppage of traffic on the great structure."

Consider then, if fog can be dispelled, are we not criminally indifferent, if we make no effort to dispel it?

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THE RAILWAY VOTE IN THE CAMPAIGN.

MORE than three years ago, in the pages of THE NORTH AMERICAN REVIEW,* I called attention to the influence which the "Railway Vote" might exert in national politics. The proposition then under discussion was the possibility of organizing a new political party by combination of the various interests which are dependent on the prosperity of the railway companies. These interests include four classes, viz., (1) the railway employees themselves; (2) the holders of railway securities; (3) those engaged in allied trades and industries which are supported by patronage of the railways, and (4) such others, as tradesmen, boarding-house keepers, etc., as derive their living from the railway employees or the employees of the other trades and industries already referred to. The number of voters in this last category is, of course, impossible of accurate ascertainment. The other three classes, however, if united, would give a massed voting strength of over three millions.

"It is not, then, surprising," it was said at that time, "that enthusiasts should declare that it would not be necessary to do more than go through the mere form of organization—to call a meeting or two and issue a few pronunciamentos—for the leaders of the new party to be able to dictate a presidential nominee and the outlines of a policy to either of the two great parties."

The probability of such a movement at that time was confessedly very remote: although considerably less remote than was assumed by most of the critics who subsequently discussed the subject in the daily and weekly press. That the probability is still remote is not because the railway inter-

* *A Railway Party in Politics*, by Harry P. Robinson, NORTH AMERICAN REVIEW, May, 1893.